Nebraska experience

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Over the past two decades, occasional pet, livestock, and wildlife deaths, and skin rashes and gastrointestinal illnesses have been reported at lakes and ponds in Nebraska, but rarely were cyanobacteria blooms suspected as the cause. In October 2003, a workshop taught by Dr. Russell Rhodes for several Nebraska agencies, raised awareness of cyanobacteria problems. On May 4, 2004, when two dogs died after drinking water from Buccaneer Bay Lake, Nebraska began to actively address cyanobacteria issues for the first time. Water samples and an autopsy on one of the dogs revealed that the dog deaths were likely due to high concentrations of the cyanobacteria toxin Microcystin LR. These dog deaths were reported in the national news and investigated by the Federal Center for Disease Control. Meetings between state agencies and public health organizations were held and joint strategies for cyanobacteria monitoring and public notification were developed and implemented within two weeks after the dog deaths. During this timeframe, three more dog deaths were reported at two other lakes with cyanobacteria blooms. Weekly sampling of lakes for algae identifications and microcystin concentrations were initiated during the week of May 17, 2004. Abraxis microcystin ELISA laboratory equipment and supplies were purchased to provide the State with a semi-quantitative analytical method and a quick turnaround time for measuring cyanobacteria toxin concentrations so that weekly public health advisories and alerts could be issued. Algae identifications and relative biomass estimates were conducted by the University of Nebraska-Lincoln. A conservative approach was used to measure worst-case microcystin conditions and protect public health. The Abraxis microcystins ELISA kit was selected because it measures all variants of microcystins, not just the LR variant, and samples were frozen and thawed three times to lyse algal cells and release the toxins. An action level of 15 ppb was selected for use in Nebraska for issuing health alerts in 2004, and a level of 2 ppb was used in issuing health advisories. Public notification methods included developing a fact sheet about cyanobacteria, weekly updates to health alerts and advisories on the NDEQ web site, emails to interested agencies and organizations, news releases and interviews with newspapers and radio and TV stations, and posting of warning signs at lake beaches and boat ramps.

On Monday, July 12, 2004, Pawnee Lake near Lincoln, Nebraska, was sampled for microcystins following a complaint about cyanobacteria blooms. When the lake was sampled, heavy blooms of Aphanizomenon and Microcystis were observed throughout the lake. Microcystin levels >15 ppb were measured and a health alert was issued for Pawnee Lake and local authorities were asked to post signs at the boat ramp and at both swimming beaches. Unfortunately only one sign was posted at one of the beaches and no signs were posted near the boat ramp. During the weekend of July 17-18, 2004, more than 50 people complained about symptoms such as skin rashes, lesions, blisters, vomiting, headaches, and diarrhea after swimming or skiing in Pawnee Lake. Although unfortunate, this incident provided evidence that the initial health alert action level in Nebraska was protective, and that improved methods of informing the public and posting signs were needed. During 2004, in addition to the five dog deaths and Pawnee Lake public health problems, several livestock and wildlife deaths and additional complaints of skin rashes and gastrointestinal illnesses were reported in lakes throughout Nebraska. All indications are that this was an abnormal year for cyanobacteria blooms and toxicity problems. A total of more than 700 lake samples were collected during 2004, with health alerts issued for 26 lakes and health advisories for 69 lakes. Four lakes were on health alerts for 12 or more weeks. The primary cyanobacteria bloom-forming genera in Nebraska were Anabaena, Aphanizomenon, and Microcystis. Isolated seasonal problems with Oscillatoria and Cylindrospermopsis occurred at some lakes. Preliminary assessments of microcystin and associated data indicate that lower water levels from the recent drought conditions, extended periods of cloud cover, and lower nitrogen to phosphorus ratios may have contributed, in part, to the increased numbers of cyanobacteria-related complaints and problems that occurred. In 2005, special studies are being implemented to better identify cause and effect relationships for cyanobacteria blooms and to determine if microcystin toxins accumulate in fish fillets. Changes to sampling protocols and public notification methods have also been made.